Excellency in Council will await with interest the reports showing the results of the special measures which have been adopted in some provinces. It is clear that much still remains to be done; but if sustained efforts are made and well-considered plans adopted for the extermination of wild beasts and deadly snakes, His Excellency in Council believes that the number of deaths from these causes will in course of time be materially reduced.—Simla, November 8, 1882."

From the above it appears that more vigorous measures than any hitherto adopted have been taken for the destruction of venomous snakes, and the contrast of the results of 1881 with those of 1880, warrant the anticipation of further benefit if these measures are only carried out with a sustained determination to succeed. It is mainly a question of perseverance and the expenditure of money, and one can hardly imagine a more desirable object on which to expend both energy and rupees. But it is essential that the system be laid down on some general principles for the whole of India, to be worked out in detail, according to the needs or peculiarities of each district. There should, in short, be a department with a responsible chief and subordinate agents, for whom certain rules should be laid down to be carried out steadily and without hindrance throughout the country, leaving much of the detail to the discretion of local authorities. I would insist on the importance of carrying it out on broad principles everywhere. When such a department is constituted under a proper head—and there are many persons well fitted for such a duty—then, I believe, venomous snakes and other noxious animals will decrease in numbers, and people will cease to be startled by these appalling losses of life.

J. FAYRER

SIR J. WHITWORTH'S MECHANICAL PAPERS[1]

THE fact that, by an order in Council of August 26, 1881, some 300 Whitworth gauges of various dimensions have been adopted as standards by the Board of Trade, is so important a recognition of the value of the labours of Sir J. Whitworth in improving mechanical measurement, that the occasion has been selected for republishing certain papers which have been long well known among engineers, but which have not hitherto been accessible to the public generally.

The first paper in the series is on plane metallic surfaces, and the proper mode of preparing them, and contains an account of an invention of great simplicity, but of the highest practical importance. Such plates, when worked up to an extreme degree of accuracy and finish, form an approximation to a plane surface which would surprise and delight any geometrician who had an opportunity of critically examining and testing their qualities. They consist of an assemblage of minute bright surfaces very evenly distributed over a plate of cast iron, and very near together.

As to their qualities, there is not space here to describe them, but they have formed the subject-matter of an excellent lecture by Prof. Tyndall, at an evening meeting of the Royal Institution in the year 1875.

Passing from these so-called true planes, we refer to a step involving an original conception which has led to the construction of the new standard gauges. The production of an approximately true plane surface gave an increased value and importance to the feeling of contact between prepared metallic surfaces, and resulted in the invention of a measuring machine which was made to depend on the sense of touch instead of upon optical contrivances, and was founded entirely on truth of surface.

The improvement consisted in the substitution of end for line measure, and inasmuch as these are technical terms, it may be well to explain them.

As stated in the last paper of the series, the English standard yard is an example of line measure, being represented by the interval between two lines drawn across two gold studs sunk in a bronze bar about 38 inches long, the temperature being at 62° Fahrenheit.

The standard yard, from the subdivisions of which the standard inch has been obtained on the Whitworth system, is a rectangular metal bar with plane sides capable of resting along its whole length in rectangular V grooves, which are plane surfaces, while the ends of the bar are planes lying perpendicular to its axis. The bar is exactly 36 inches long, and the measurement is complete when the degree of contact between its ends and two small true planes abutting against them is ascertained. Such a measurement is, of course, end measure, and its accuracy depends throughout upon truth of surface, and also upon truth of position of surface. The ends of the bar must be perpendicular to its axis, and the planes which feel those ends must be truly parallel to each other, and one at least must be movable to and fro without deviating at all from the position of parallelism to its fixed neighbour.

Then comes the question of the amount of shifting of the movable plane. That is done by a micrometer screw, the linear motion for one graduation of the micrometer head, which can be easily read without a lens, being in some cases 1-10,000th of an inch, and in other cases 1-1,000,000th of an inch.

There is not space to discuss the measuring machine, whether as capable of producing cylindrical gauges varying by 1-10,000th of an inch, or as capable of reproducing a standard inch or a standard yard to a degree of accuracy which leaves the microscope far behind in the contest.

It must suffice to point out that the reprinted papers are full of interest, as showing the manner in which Sir J. Whitworth has thought out and accomplished the work of improving the construction of machinery, and it is matter of regret that those who are occupied in teaching mechanics have not better opportunities than now exist of becoming practically conversant with the subject-matter of the collected papers.

NOTES

FROM Punta Arenas, near the extremity of South America, intelligence has been received that the fourth section of the German expedition sent out to observe the transit of Venus has been particularly successful, Professor Auvers having managed to take exceedingly good photographs and numerous measurements.

A TELEGRAM received from Monte Video states that the *Volage* has anchored in these roads from Santa Cruz in Patagonia. Capt. Fleuriais and observers of the transit of Venus were on board, returning to France with their instruments, photographs, and other documents.

M. TRÉPIED, in a communication to the Paris Academy on his observation of the transit in Algiers, states that clouds rendered the ordinary observations of little value, but that some good results were obtained with the spectroscope on the borders of the planet in the region from A to E; while some photographs were obtained in the green, the blue, and the violet. The examination of the spectral lines in the groups A, B, α, in the regions comprised between α, D, E, did not show, M. Trépied states, anything which could be attributed to a selective absorption produced by an atmosphere on the planet. The same inference is deduced from the photographs.

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[1] "Papers on Mechanical Subjects." By Sir Joseph Whitworth, Bart., F.R.S., D.C.L., Vol. I. True Planes, Screw Threads, and Standard Measures. (London: Spon.)

AT a recent conference of members of the British Association, held in the rooms of the Geographical Society, a protest was drawn up against the proposed meeting of the Association in Canada in 1884.

AT the Conference of Head Masters the other day one of the subjects discussed was the teaching of geography in schools, in which many varied and vague opinions were expressed. There is in this country too great a tendency to treat geography as mere topography, the mere dry bones of the subject, which can only be clothed with flesh and endowed with life through the medium of the physical and natural sciences. We advise those teachers who desire to make the subject of geography both interesting and useful to make themselves acquainted with the programmes of German schools and universities under that head.

THE Société d'Encouragement has held its annual meeting for 1882, and awarded its gold medal to M. Gaston Planté for his work in the accumulation of electricity.

IN a recent number of the St. Petersburg Academy's *Bulletin* (1882, t. xxviii. p. 163), Herr Kortazzi reports on his observations of Jupiter at Nikolajus from September, 1879, to December, 1881, giving, in four plates, forty-seven drawings of the planet. The time of rotation, calculated from the red spot, he finds to have continually diminished, but not according to an ascertained law; more recently an increase has appeared. The spot can hardly (he considers) be regarded as gaseous; it is more likely a liquid or even solid mass forming part of the planet's surface. In the former case it might be considered a large lake in an ocean of other liquid, which covers the southern hemisphere of Jupiter, and it might be expected that this lake, owing to currents flowing over the surface of the planet, would gradually be diffused and spread over the whole surface, or at least over the whole parallel. If the spot were a solid projection from the solid body of the planet (if such a body there be), it would be impossible to account for the observed changes of position. The most plausible view is, that it is a solid floating mass on the surface of an ocean; but even this hypothesis the author considers bold, since we are not entitled to infer by analogy from terrestrial phenomena the nature of forms on Jupiter which may be very different in internal nature from the earth.

A DOE having horns, which gave it the appearance of the male animal, was recently killed in the woods of Herr Pönsgen, near Aix-la-Chapelle. The longer horn was about 19 centimetres in length. Such a case is rare, though small rudiments of horns are sometimes met with in old does. A picture of the animal is given in the *Revista Scientifico-Industriale*, October 31.

TO illustrate the effect of expansion of the bulbs of liquid thermometers on the indications of those instruments, Prof. Govi connects a capillary tube with a bulb of ebonite, and partly fills it with mercury. Such a thermometer does not indicate gradual variations of temperature (within certain limits). With rapid variations, the mercury shows *inverse* movement (descending with heat and rising with cold), but after some time the original level is restored, while the excess of heat or cold is lost. The phenomena are due to the almost perfect equality of the coefficients of cubical dilatation of ebonite and mercury, at least between zero and 50° or 60° C.; and to the fact, that with sudden changes of temperature, the bulb responds first, and being a bar conductor, transmits slowly to the mercury.

A RECENT report by M. de Bezerédy, Government Commissioner for cultivation of silk in Hungary, shows that the industry is making considerable progress in that country. In 1881 there were 2976 producers, who obtained 41,537 kilogrammes of cocoons in 426 communes, and the produce was sold for 41,816 florins. The corresponding figures for 1880 are: 1059 producers, 10,132 kgr., 109 communes, and 11,062 florins. The Commissioner sold in Italy the produce of 1881 for 63,000 florins, and the profit so realised allowed of the institution of a model school for silk-cultivation, without exceeding the credit voted by the Chamber. This school has received three primary teachers sent by the Minister of Public Education, and three from the Minister of Commerce; three more are maintained at private expense. These nine will acquire knowledge to be afterwards utilised in their place of residence. Further, a professor in the Model School of Graz has given public lectures on the rearing of silkworms in several villages, and more than 80 kgr. of cocoons have been distributed continuously to cultivators. Lastly, 28,956 mulberry trees have been planted at Government expense. The report recommends the establishment of spinning mills in the country, and the plantation of mulberry trees on land belonging to the communes, and on the Government roads. The climate of certain regions of Hungary is highly favourable to the production of silk.

THE *Times* Geneva correspondent states that the recent heavy rains, which recommenced on Friday, with, if possible, greater violence than before, are producing disastrous consequences in various parts of Switzerland. A considerable extent of ground, covered with vines, at Espesses, in Canton Vaud, is slipping rapidly towards Lake Leman, and, unless the measures taken by the engineers succeed in arresting its progress, must soon be engulfed. An earthslip has also taken place near Troistorrents, and another at Pully, in the same neighbourhood. Up to the end of November there had been 200 rainy days in that part of Switzerland since the beginning of the year, and only 50 days of sunshine.

AN international exhibition will be held in Calcutta next December. There will be nine principal sections: (1) fine arts; (2) apparatus and application of the liberal arts; (3) furniture and objects used in dwellings; (4) clothing, including fabrics; (5) products of mining industry, forestry, &c.; (6) apparatus and processes in the common arts; (7) food; (8) artisans' workmanship; and (9) children's work. An attempt will also be made to hold an exhibition of live stock, agricultural and horticultural products, and of a loan collection of paintings, sculpture, and works of art generally. The usual gold, silver, and bronze medals will be awarded by special juries of experts. The exhibition will be opened on December 4, 1883, and will close on February 29, 1884.

M. GERMER BALLIÈRE has published an edition of Father Secchi's "Les Étoiles" in two volumes, as a part of the Bibliothèque Scientifique Internationale.

THE Academy of Moral and Political Sciences has announced the conditions of the competition opened every year for the prize of 200*l*. to be devoted to the author of the work, which is to "faire aimer," morality and virtue, and "faire repousser," vice and egotism.

M. DE CHANGY, the first electrician who attempted to manufacture incandescent lamps *in vacuo* about twenty years ago, has constructed a small model for demonstration. The carbon is rectilinear, which permits a very small length to be given to it. It is to be lighted with bichromate of potassium elements. In his former attempts M. de Changy advocated very small carbons cut in the graphite from the retorts. Now his fibres are carbonised according to the common practice.

THE introduction of western improvements into China by Europeans is evidently a work beset with many difficulties. Some years ago the only railway in the country was purchased by the Government from the proprietors and promptly torn up; but now the officials themselves are laying down railroads from the mines in North China to the nearest canal. The telegraph also had to encounter a vigorous opposition from the authorities and people for many years; at present, however, the capital is connected by wire with the coast. The electric light is the latest improvement which has excited the suspicion and dislike of the Mandarins. The foreign settlement at Shanghai has for some time been lighted on the Brush system, apparently much to the comfort and jubilation of the denizens of the "model settlement," as the foreign portion of the city is generally called. The promoters appear, however, to have reckoned without the Chinese officials. They probably thought that where gas was permitted, there could be no objection to electricity. The Chinese Governor of the district appears to be of a different opinion. He has addressed a letter to the senior Foreign Consul requesting the removal of all the electric lamps. He has read, he says, in translations from European papers, that terrible accidents have arisen from electricity, and flatly refuses to permit the residents of Shanghai to be exposed to such dreadful risks. Hundreds of thousands of houses might be destroyed, millions of lives might be lost; even the walls of the city might be blown down if anything went wrong with the machines. He has strictly forbidden his own countrymen to use it, and has peremptorily ordered those who have already adopted it to discontinue it forthwith. Whether this ukase will be immediately obeyed or not it is impossible to say; but past experience leads us to the conclusion that if the Chinese have determined to set their face against the electric light, no power on earth can get them to permit it in their territory. Their leading principle in these matters seems to be a dislike of all innovation until its necessity is clearly demonstrated by *their own* experience, and a determination that new inventions or appliances shall not be foisted or forced on them from outside. The late difficulty with Russia showed them the imperative necessity of being prepared for war, and of having their capital in direct communication with the outer world. Ironclad ships and rifled guns are accordingly being purchased with extraordinary rapidity; forts are being erected at various points on the seaboard, and a telegraph line about 800 miles in length was constructed in the course of a few months. Perhaps, after all, the Chinese policy in this respect is not so wrong-headed as it sometimes appears. It certainly saves them from the wiles of speculators and promoters of all sorts.

THE additions to the Zoological Society's Gardens during the past week include two Bonnet Monkeys (*Macacus radiatus* ♂ ♀) from India, presented by Mr. Nathaniel Cotton; two Slender Loris (*Loris gracilis*) from India, presented by Dr. H. W. Lentaigne; a Leopard (*Felis pardus*) from India, presented by Capt. Park; a Crimson-crowned Weaver Bird (*Euplectes flammiceps*) from Madeira, presented by Mr. E. W. Gain; a Common Heron (*Ardea cinerea*) from Scotland, presented by Mr. W. H. Henderson; eleven Muscovy Ducks (*Cairina moschata*) from South America, presented by Major Finlay; a Hoary Snake (*Coronella cana*), a Crossed Snake (*Psammophis crucifer*), a Rhomb-marked Snake *Psammophylax rhombeatus*) from South Africa, presented by the Rev. G. H. R. Fisk, C.M.Z.S.; two Golden-winged Woodpeckers (*Colaptes auratus*) from North America, purchased; a Golden-Eye (*Clangula glaucion* ♂), British, on approval; a Molucca Deer *Cervus moluccensis* ♀), born in the Gardens.

OUR ASTRONOMICAL COLUMN

STELLAR PARALLAX.—The results of a series of observations with the filar micromerer on the Washington refractor for the determination of the annual parallax of α Lyræ and 61 Cygni have been printed in advance of the publication of the yearly volume of observations. The measures were made by Prof. Asaph Hall, those of α Lyræ extending from May 24, 1880, to July 2, 1881, on seventy-seven nights, and those of 61 Cygni from October 24, 1880, to December 7, 1881, on sixty-six nights. The magnifying power employed was 383. Prof. Hall remarks that since observations of the angle of position made with the micrometer-circle are less accurate for distances that enter into the determination of parallax, he observed simply the difference of declination of α Lyræ and the companion of the tenth magnitude, and in the case of 61 Cygni the difference of declination of the smaller component and a star of 9·5 magnitude about 3′·3 south of the double star, which is D.M. + 38°, No. 4345. α Lyræ was observed both with bright and dark wires, for 61 Cygni only the dark wires were used. It may be noted that the star measured is the following component of the double star. The course of observation pursued for each night's set of measures is describ d, and except on one occasion the same programme was followed throughout.

The resulting parallax for α Lyræ is, 0″·1797 ± 0″·00561; the time required for light to pass from the star to our sun is thus found to be 18·11 Julian years.

For 61 Cygni the parallax is 0″.4783 ± 0″·01381, and light requires 6·803 Julian years to traverse the space that separates this star from the sun.

The parallaxes it will be seen, are obtained by the differential method, and are thus relative, or they are the differences of the parallaxes of the two stars. To get the absolute parallax of the bright star it is necessary to add the parallax of the small star. Prof. Hall says that he might have effected this by means of the parallaxes for stars of different magnitudes given in Struve's table in his "Études d'Astronomie Stellaire," but as the whole matter is uncertain, he has omitted this reduction.

Dr. Ball, Astronomer Royal for Ireland, continues his researches on stellar parallax, at the Observatory of Dunsink, Dublin, and has lately published a determination of the parallax of 6 (Bode) Cygni, which is the well-known double star No. 2486 of Struve. The components are of 6 and 6·5 magnitudes. The existence of a parallax to a very measurable amount was suggested during the course of a series of preliminary observations in 1879 and 1880 for the detection of such proximate objects, and a systematic course of observation was commenced on October 3, 1880, and continued to December 22, 1881. 6 B. Cygni is No. 196 of Argelander's list of 250 stars having large proper motion, given in vol. vii. of the Bonn Observations, where it has attributed to it an annual motion of 0″·636 on an angle of 346° 27′; Argelander's positions belong to the preceding component. Dr. Ball has employed the following one in his investigation. Measures were obtained on twenty-six nights, the mean date being 1881·5207; they were made from a star *n.f.* of the 10·5 magnitude, the adopted mean distance of which is 170″·692.. and position angle 78° 18′ 61″. If this small star is assumed to be at rest, and Argelander's proper motion attributed to the double star, the annual increase of distance is + 0″·02, and that of angle + 12′·796; thus almost the whole proper motion applies to change in the position angle. The observations show that there is no regular increase of distance, and hence, Dr. Ball observes, there is *primâ facie* evidence that the comparison star does not participate in the proper motion.

The resulting parallax of Σ 2486 is—

From the distances	... ...	0″·5039 ± 0″·060
From the angles	... ...	0·383 ± 0·13

Combining these two values, we have for the parallax 0″·482 ± 0″·054. It is intended to make another series of observations of this star, the present result being regarded by Dr. Ball as merely provisional, though he thinks it can hardly be doubted that a parallax of very considerable amount really exists. The place of the star is in right ascension 19h. 8m. 20s., with 49° 35′·3 north declination for 1855·0.

COMET 1882 *b*.—The following positions of this comet for midnight at Greenwich, though liable to an error of several minutes of arc, may serve for finding it in the telescope without difficulty.

	Right Ascension.		Declination.		Log. distance from	
	h.	m.	°	′	Earth.	Sun.
Dec. 31	7	14·9	−29	28	0·2365	0·3883
Jan. 2	7	9·2	29	10		
4	7	3·7	28	49	0·2489	0·3991
6	6	58·4	28	26		
8	6	53·3	28	2	0·2622	0·4096
10	6	48·4	27	36		
12	6	43·8	27	8	0·2763	0·4196
14	6	39·4	26	40		
16	6	35·2	26	10	0·2912	0·4294
18	6	31·2	25	40		
20	6	27·4	−25	9	0·3067	0·4388